

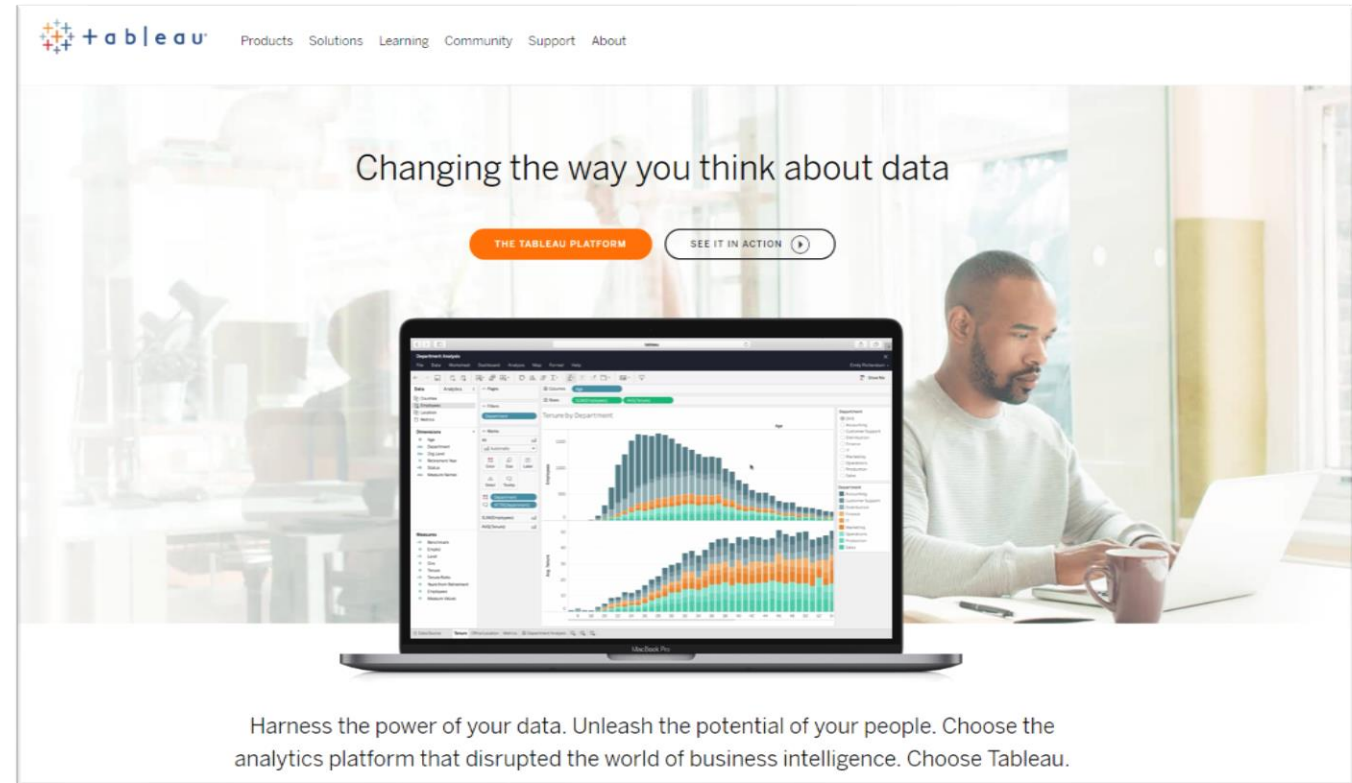
# **An Introduction to Analysis and Data Visualization using Tableau Software**

# Presentation Overview

- 01 What is Tableau Software?
- 02 Benefits for Teachers & Researchers
- 03 What is Data Visualization?
- 04 General Overview of Tableau
- 05 Use for Reporting - Examples
- 06 Use for Storytelling - Examples
- 07 Use for Analysis - Examples
- 08 Advanced Features - Example
- 09 Resources (Public, WMTUG, Books)

## What is Tableau Software?

- Software company Founded in 2003 from Stanford research
- Intent is to bring 'data to the people' through easy to use data visualization software
- Would be classified as a hybrid business intelligence (BI) / analytics software company
- Used by many of the largest companies in the world and most large companies in West Michigan



The image shows a screenshot of the Tableau website's main banner. At the top left is the Tableau logo, followed by navigation links: Products, Solutions, Learning, Community, Support, and About. The main headline reads "Changing the way you think about data". Below this are two buttons: "THE TABLEAU PLATFORM" and "SEE IT IN ACTION". The central visual is a man sitting at a desk with a laptop, looking at a Tableau dashboard. The dashboard displays a complex data visualization with multiple stacked bar charts and a line graph, all rendered in Tableau's signature color palette of blue, orange, and green. The background of the banner is a blurred office setting.

Harness the power of your data. Unleash the potential of your people. Choose the analytics platform that disrupted the world of business intelligence. Choose Tableau.

## What is Tableau Software?

- Similar tools to Tableau include Microsoft Power BI, Qlik, Tibco Spotfire, and Looker – these are all data visualization tools

Figure 1. Magic Quadrant for Analytics and Business Intelligence Platforms



Source: Gartner (February 2019)

## What is Tableau Software?

### We believe in power for the people

Building a company that fundamentally changes how people see and understand data requires a different philosophy. So Tableau founders imbued their company with disruptive points of view.

Liberate Data

Empower People

Design for People

The main focus of Tableau software is for you to better understand your datasets, especially large datasets.

BI software in the past required highly technical IT skills and took a long time to build dashboards. Tableau has changed that paradigm.

Tableau invests a lot of research time into developing intuitive software. They approach software design from the human perspective.

Courtesy: [www.Tableau.com](http://www.Tableau.com)

## Benefits for Researchers & Teachers

- Free course licenses for students
- Pre-built curriculum for teaching Tableau and data analysis
- Use of powerful 'big' data platform for large datasets
- Provides skills needed in industry (various professions)



### Why Tableau?

#### In-demand skills

Data isn't going anywhere. Companies are hiring for analytical skills to tackle big data in every industry.

#### Student engagement

Spend less time teaching software and more time helping your students find deep analytical insights.

#### Easy to use

With a large library of on-demand tutorials and a dedicated support community, teaching data analysis is easier than ever.



Check out the instructor resource page for self-service learning options, ready-made curriculum materials, answers to frequently asked questions, and license support.

CHECK IT OUT →

<https://www.tableau.com/academic/teaching>

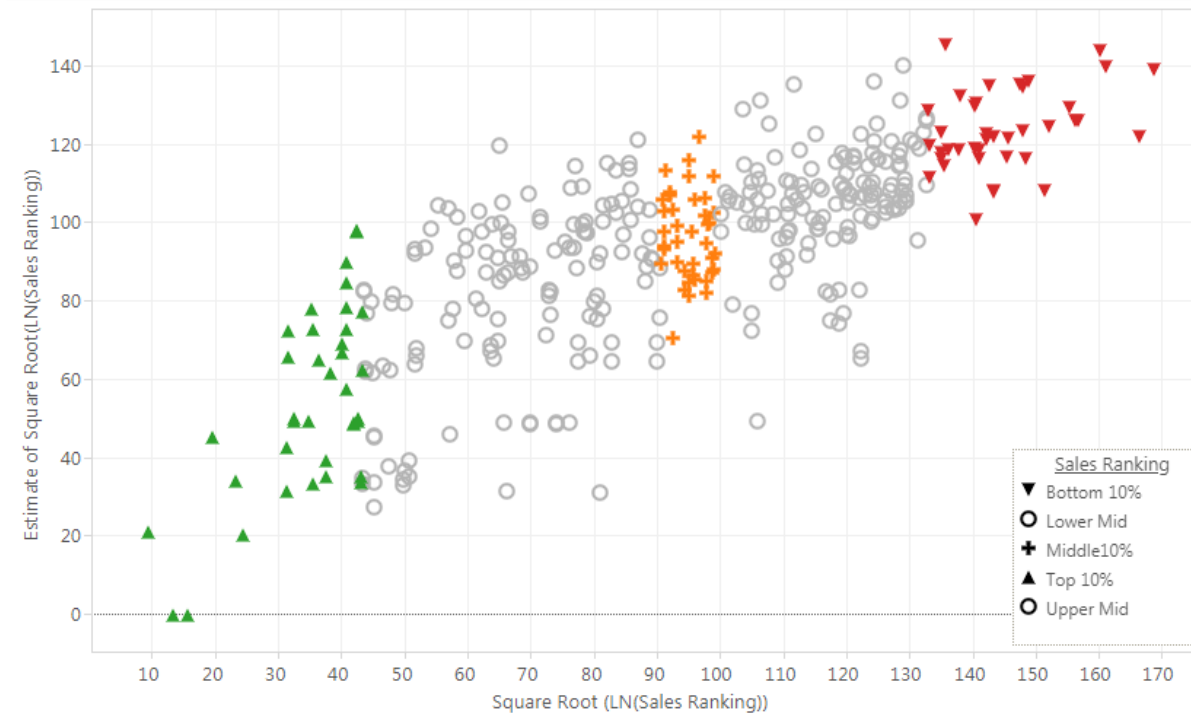
## Benefits for Researchers

- Ability to handle 'big' data (hundreds of millions of rows) that Excel cannot
- Ability to share (link) your research articles to datasets and results through Tableau Public
- Access to online help forums & local users groups
- Ability to connect to "R" and Python for more advanced analytics and analysis

### Modeling New Product Success from Component Measures of Product Advantage: *A Model Utilizing Automated Text Classification and Sentiment Analysis*

[Research Overvi..](#) [Factors by Amazon Group..](#) [Factors by Product Cate..](#) [R squared by Amazon Gr..](#) [R Squared Value by Cate..](#)

Intercept Value	Value Coefficient	Benefit Coefficient	Feature Coefficient	Superiority Coefficient	Superiority to Competition Coefficient	Quality Coefficient	Time Adj Avg Review Rating Coefficient	LN(Price) Coefficient	Avg Review Rating Coefficient	Non Product Advantage Comments C..
145.4	0.0	0.0	0.0	-14.1	-9.2	-15.4	0.0	0.0	0.0	0.0



**R2** 0.59  
**N** 238  
**Pr>Chi2** 0.013

**Amazon Ranking Category**  
Electronics

Product Name (Wildcard Search)

Price and Time Adjusted Reviews  
Do Not Include

Regression Type  
Regular Regression (Not HLM)

Product Advantage Components  
Include Product Advantage

Average Review Regression Only  
Off

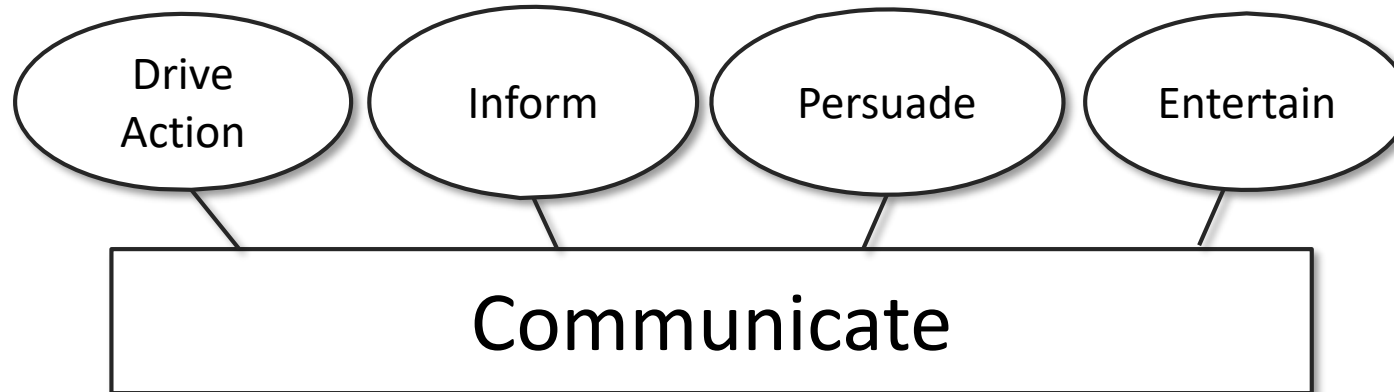
Unclassified Reviews  
Off

# What is Data Visualization?



## What is Data Visualization

### What is the Purpose of Data Visualizations?



What guides the design process?  
How do we judge success?

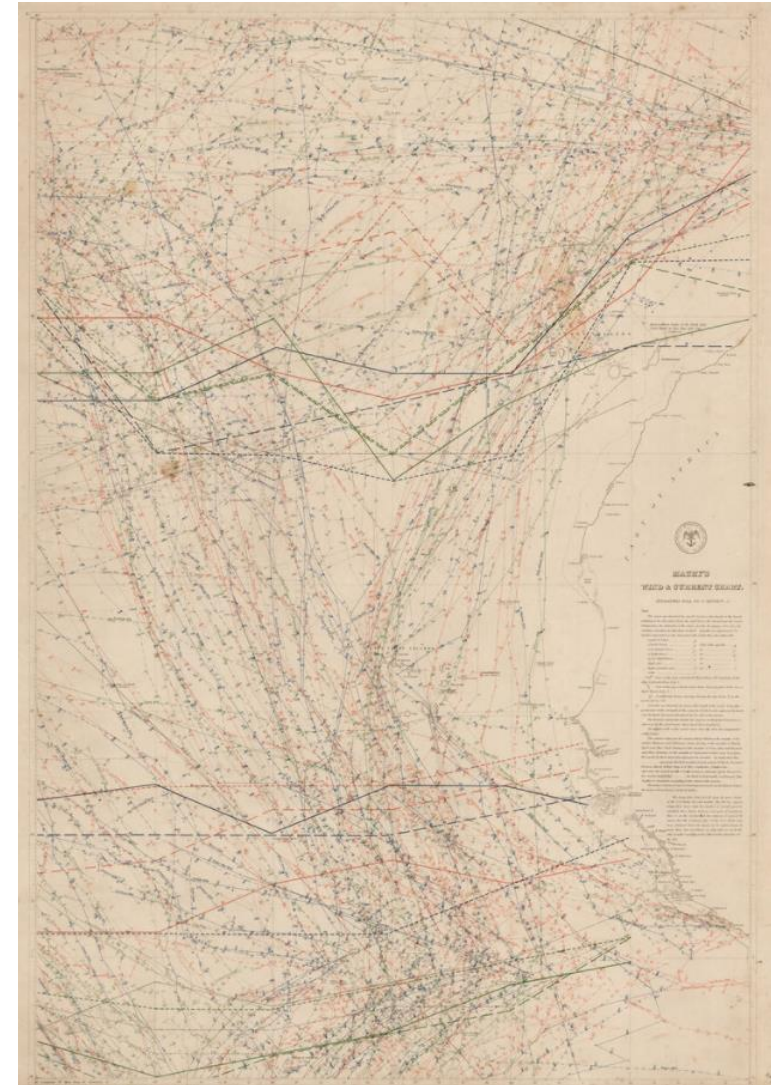
## What is Data Visualization?



[https://en.wikipedia.org/wiki/Matthew\\_Fontaine\\_Maury](https://en.wikipedia.org/wiki/Matthew_Fontaine_Maury)

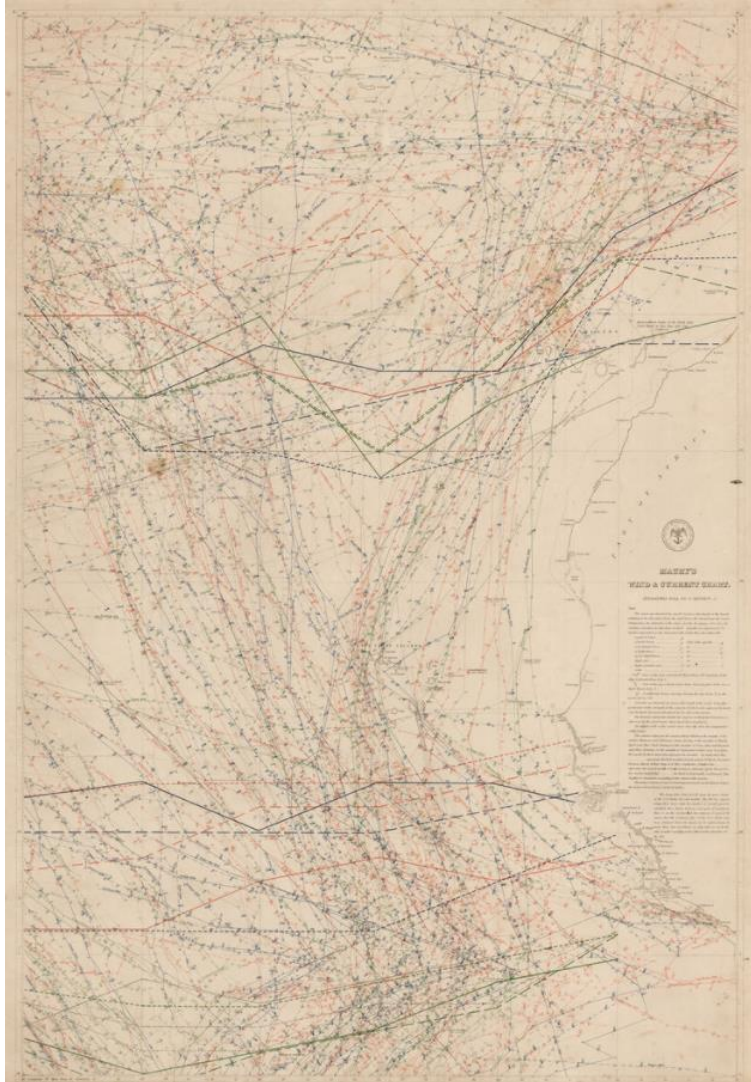
### Matthew Fontaine Maury

- Unfit for duty due to a leg injury
- Sent to Depot of Charts and Instruments
- Vault of logs from every ship in US Navy
- Hundreds of thousands of observations available in written logs
- Manual 'data mining' with his team
- Standardized collection moving forward (form)



Ref. (The Clipper Ships – Time Life Books)  
Ref. (Wind & Current Charts -1847)

## What is Data Visualization?



### Wind & Current Charts - 1847

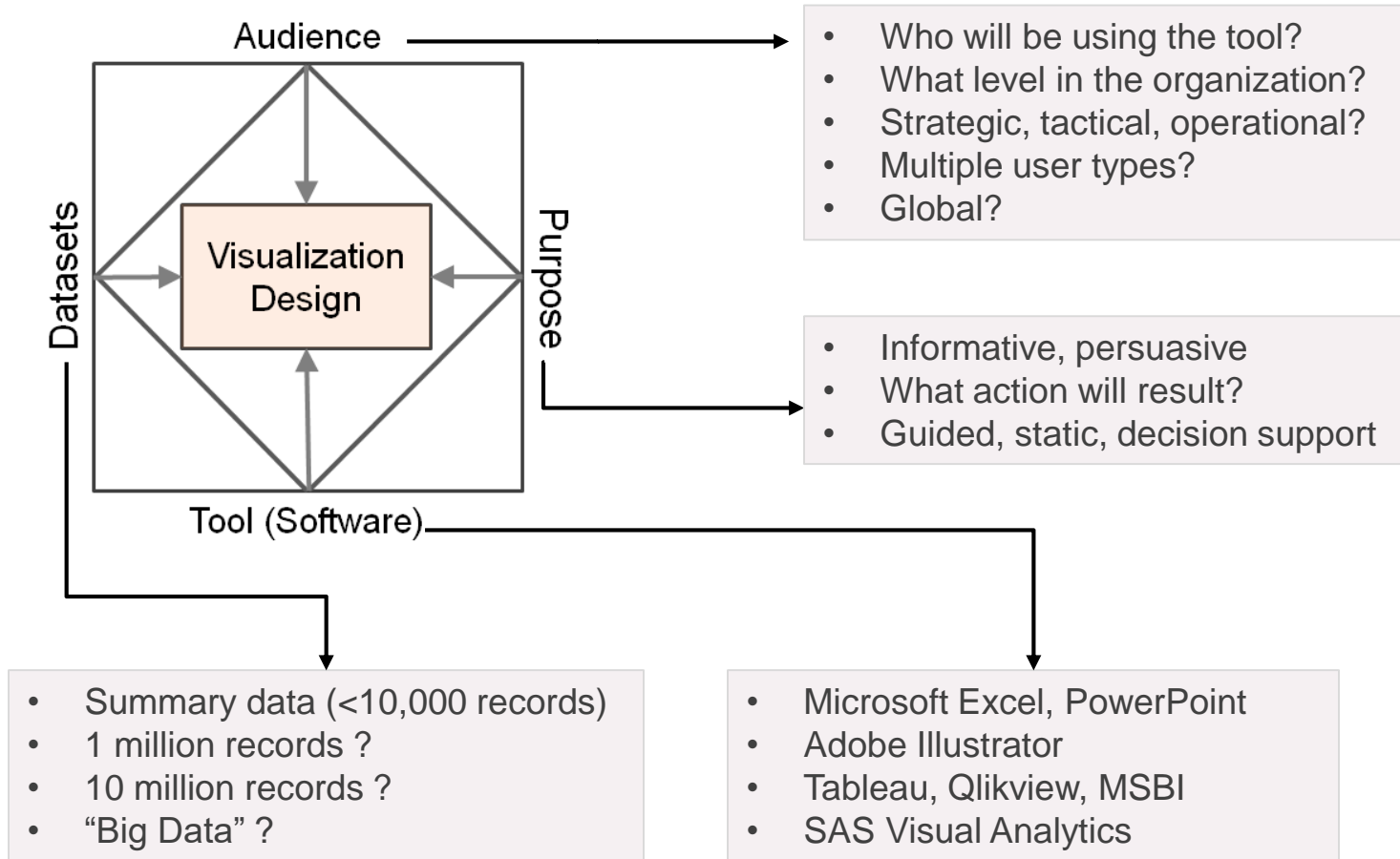
- Visualization of his team's findings
- Use of symbols and colors to highlight best routes
- Findings were counter-intuitive (heading west to go faster east)

### Results

- Roundtrip from Virginia to Rio 75 days instead of 112 days
- Found the Gulf Stream's full shape
- Cut time from Cape Horn to California by a third
- Reduced ship lost due to storms

# What is Data Visualization

## A Basic Framework – Rhetoric for Data Visualization

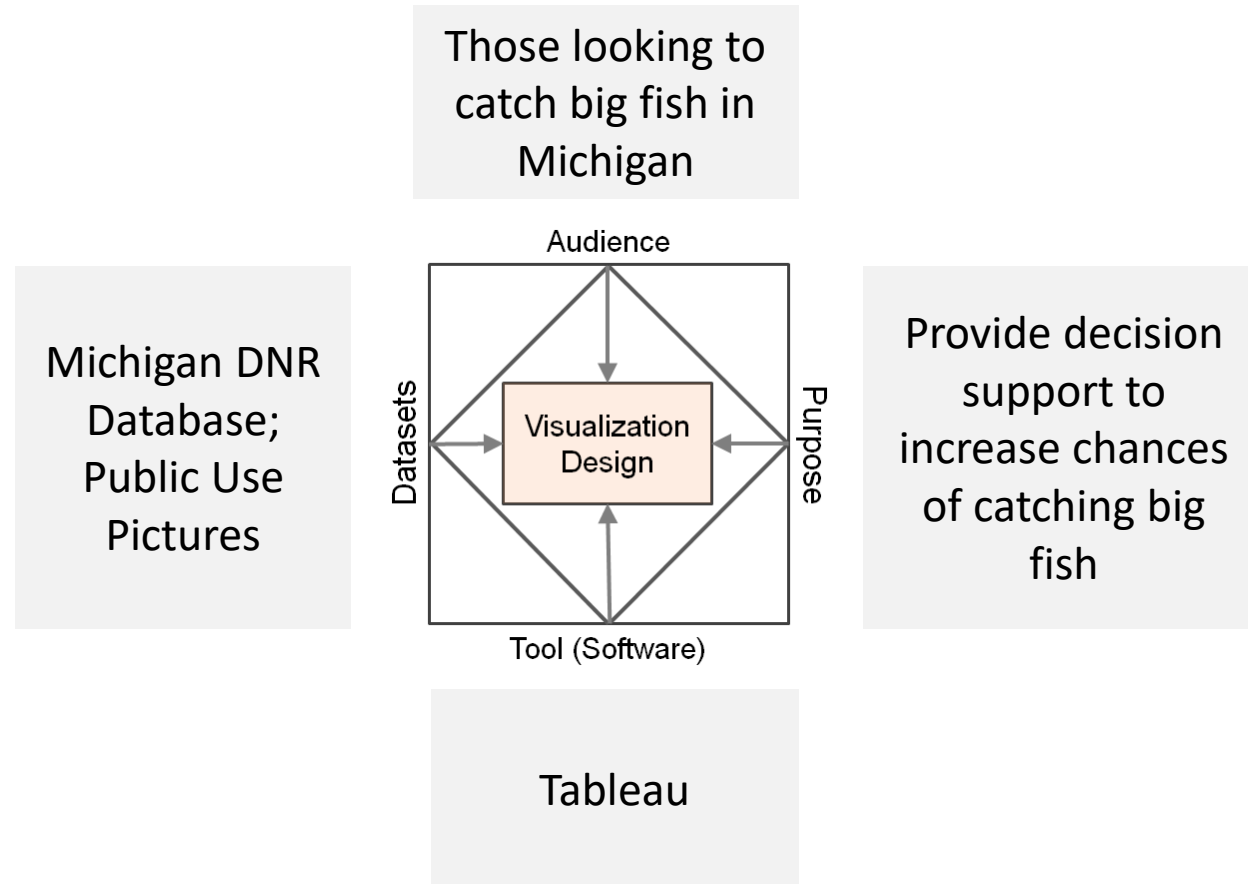


## Methodology

1. Identify Purpose (Intended Use)
2. Consider Audience
3. Research
  - i. Identify Available Datasets
  - ii. Identify Data Elements
  - iii. Benchmark Designs
4. Design
  - i. Sketch
  - ii. Iterate
  - iii. Collect Feedback
5. Execute Design
  - i. Collect Feedback
6. Document – Deploy
7. Sustain

# What is Data Visualization

## Example – Decision Support



Fishing Navigator | Data References

### Fishin' in the Mitten: Catching Big Fish in Michigan

Michigan has a diverse selection of gamefish for fishing adventures year round. Select a species from the drop down menu to find out helpful hints for catching the big ones!

**SELECT A FISH SPECIES**  
BLUEGILL

Michigan State Record(s)	Year	Waterbody	County	Inches	Pounds
	1983	Vaughn Lake	Alcona	13.75	2.75

**WHERE TO FIND BIG BLUEGILL**

For big bluegill, look no further than Houghton Lake. Use a leech and be prepared to become a Master Angler!

Based on Master Angler records from 1993-2014, the map to the left shows the 'hot spots' for big BLUEGILL. The size of the circle represents the total Master Angler award level fish caught in that location. Zoom in, or mouse over a circle for additional information about that location. Click on a circle to filter the results below for just that body of water.

**TOP FISHING METHODS AND BAITS FOR BIG BLUEGILLS**

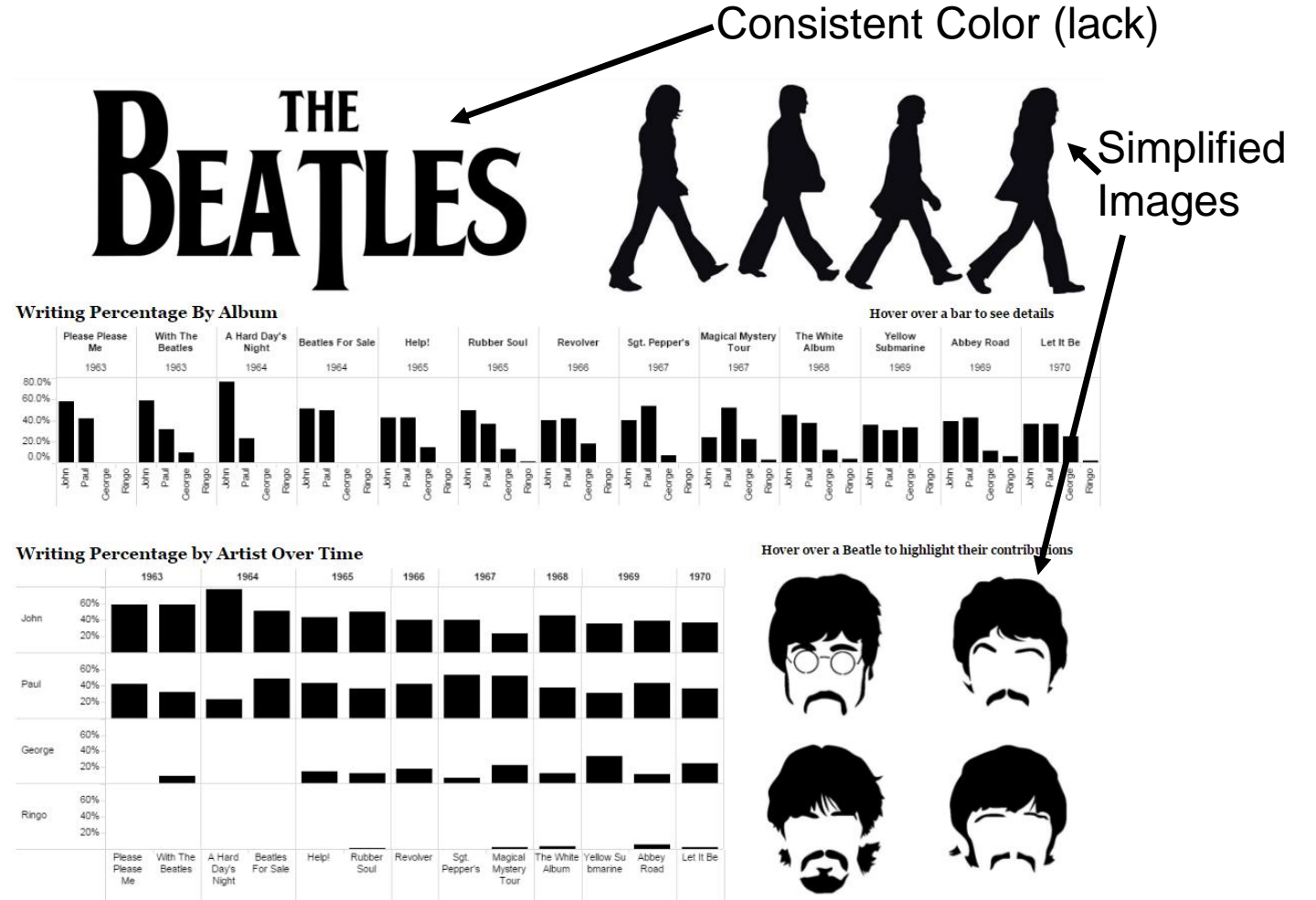
Stillfishing	46.13%	CRAWLER	28.27%
Spincasting	16.47%	WORM	18.08%
Driftfishing	12.75%	WAX WORM	9.02%
Baitcasting	10.33%	LEECH	8.29%
Ice Fishing	6.61%	RED WORM	2.16%
Trotting	3.89%	CRAWLER HARNESS	1.94%
Flycasting	3.63%	LEAF WORM	1.86%
		CRICKET	1.64%

# What is Data Visualization

## Elements of Design - Unity

*Unity is the application of methods that ensure that elements in the design appear to 'go together' - (color, font, & shape consistency)*

Consistent Font



<https://public.tableau.com/s/gallery/beatles-albums>

Author: [Mike Moore](#)

# What is Data Visualization

## Elements of Design - Hierarchy

*Hierarchy is the application of design methods to indicate importance and 'flow' within the visual (size, placement)*

Level 1

# BLAME THE WEATHER

Level 2

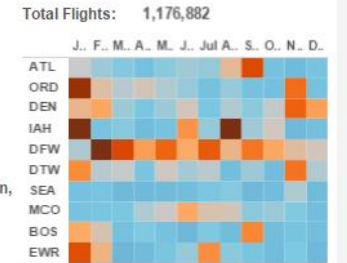
How does precipitation affect the Top 10 most traveled airports?

Level 3

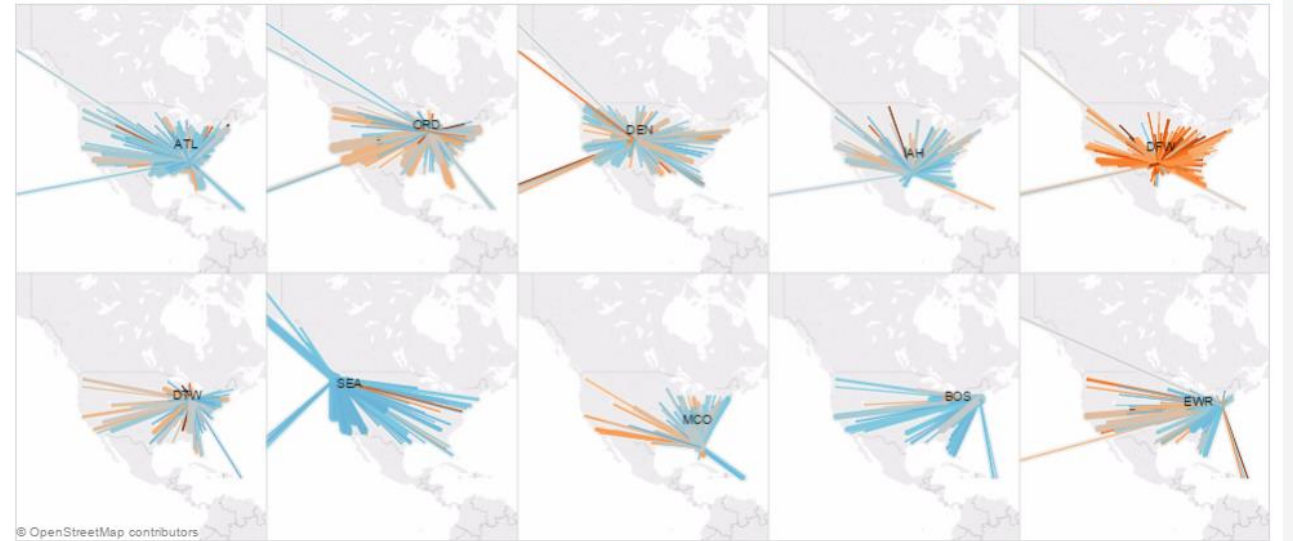


Weather Delay Minutes per Inch of Precipitation (WDMIP) is a metric used to see how precipitation impacts weather delays. Using this metric, Z scores can be calculated to see which flights and airports are more affected by precipitation. The higher the Z Score the more the flight or airport is affected by precipitation.

Use the heatmap on the right to control the dashboard. Click the airport row, month column, or individual cells to compare the affects of precipitation on weather delays.



Level 4

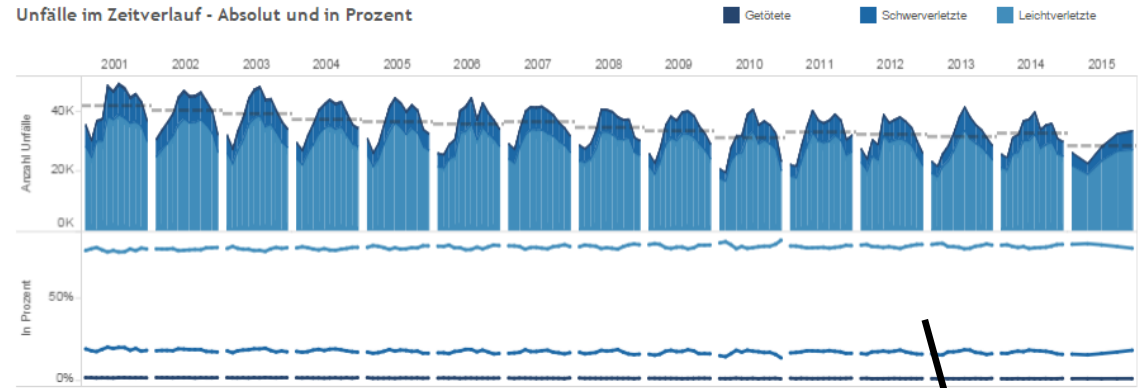


<https://public.tableau.com/s/gallery/blame-weather-us-flight-delayed-precipitation> Author: [Matt Chambers](#)

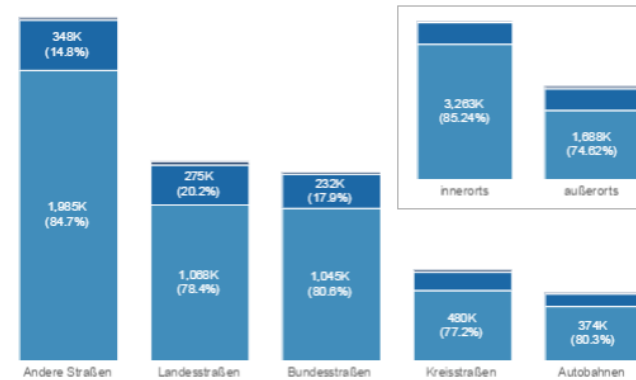
## Elements of Design - Color

*Use of color provides contrast for data points in opposition and brings attention to relevant elements within the visual.*

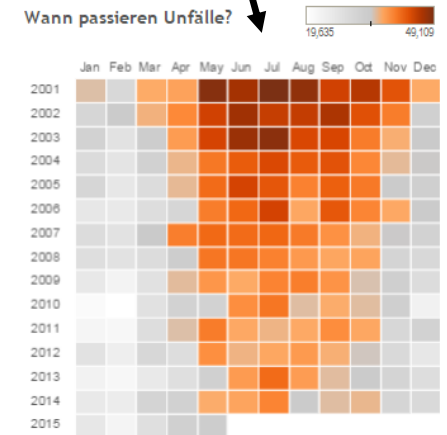
Unfälle im Zeitverlauf - Absolut und in Prozent



Wo passieren die Unfälle mit welcher Auswirkung?



Wann passieren Unfälle?



Klicken Sie auf individuelle Datenpunkte, um die Grafiken zu filtern.

Quelle: <https://www.destatis.de/DE/Startseite.html> (Statistische Bundesamt) Tabelle 46241-0004

<https://public.tableau.com/s/gallery/road-accidents-germany>  
Author: [Oliver Linder](#)

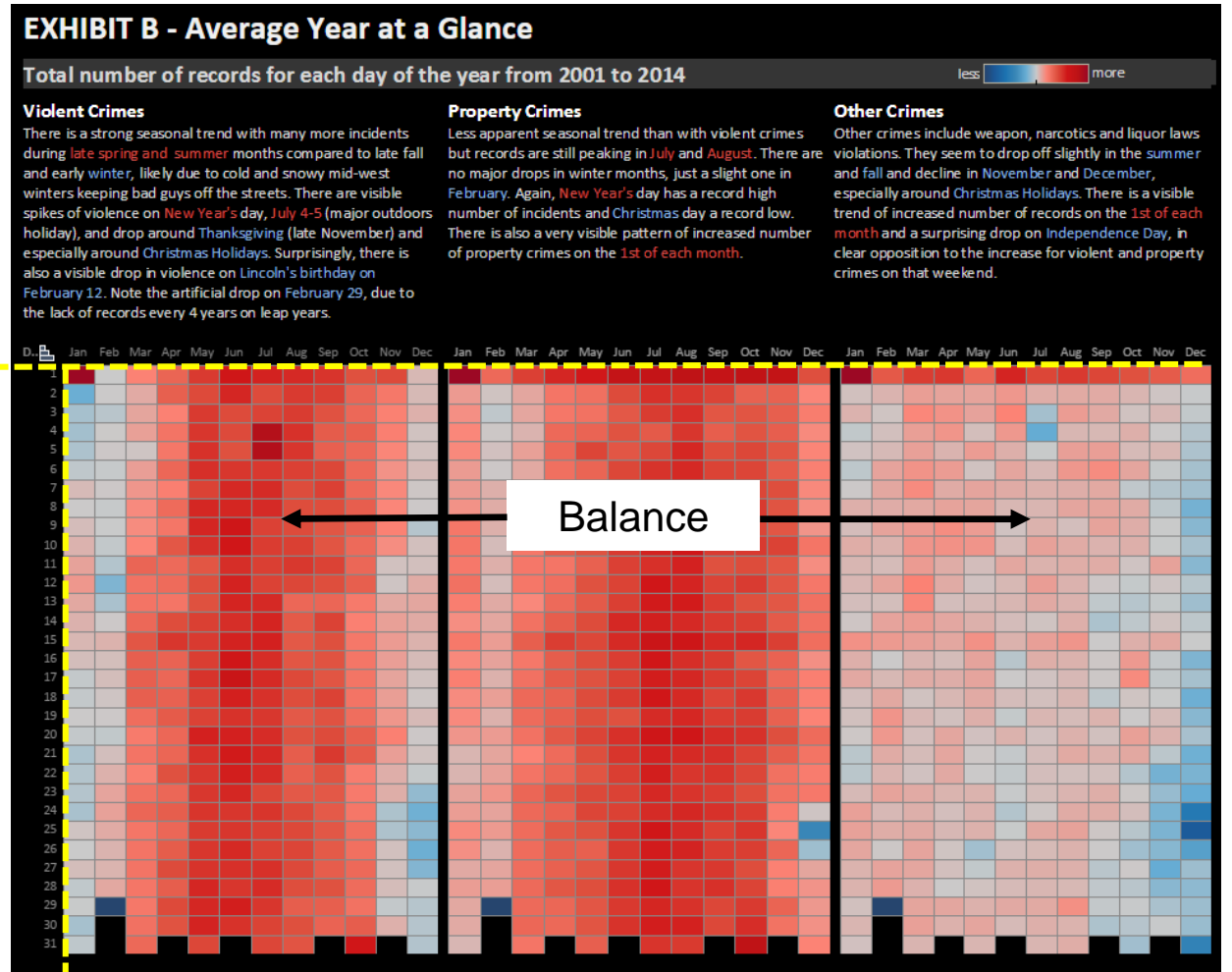


# What is Data Visualization

## Elements of Design – Balance & Alignment

*Balance and alignment are used to create harmonious visuals that do not distract from the message being communicated.*

Alignment

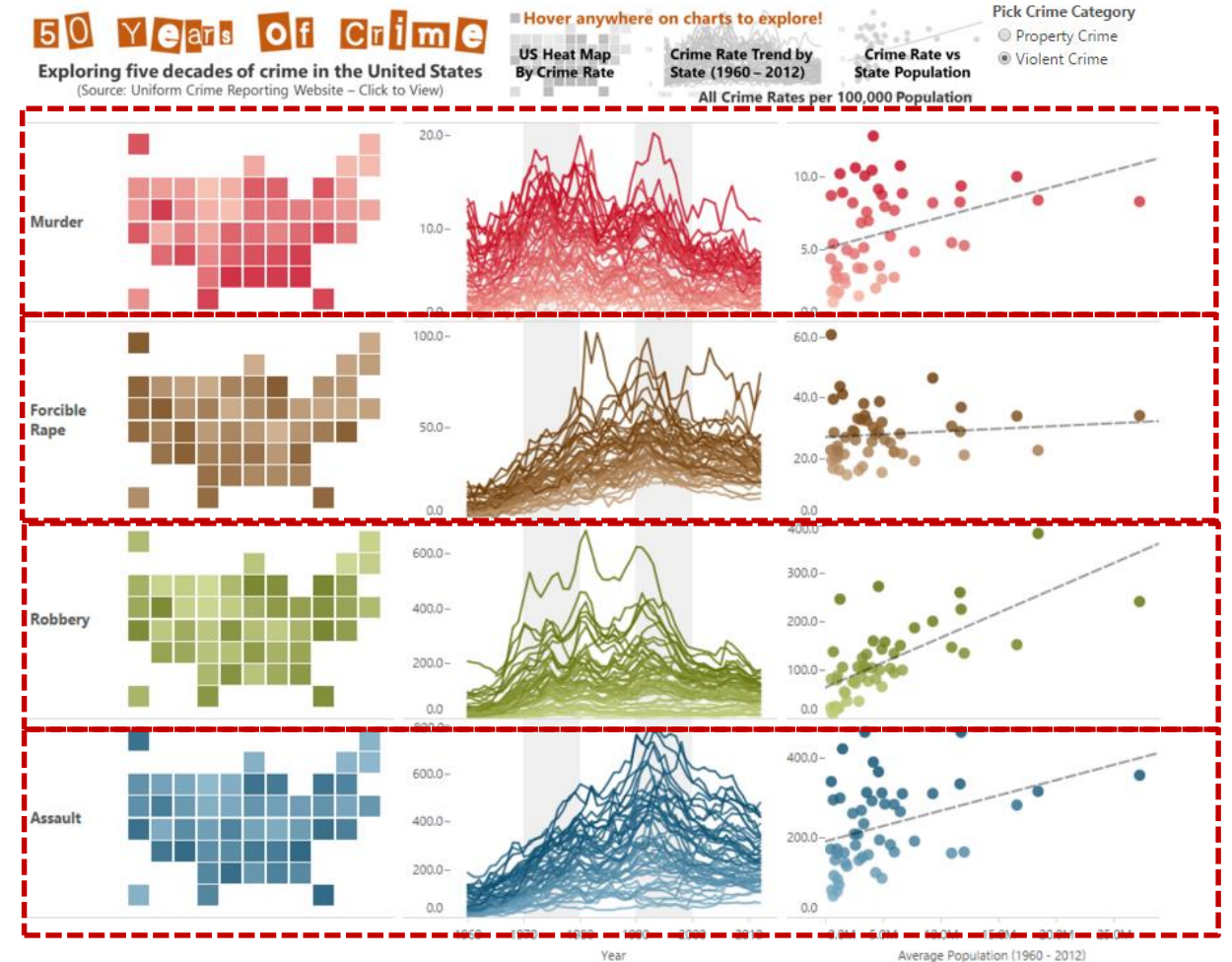


<https://public.tableau.com/s/gallery/chicago-crime-scene> Author: [George Gorczyński](#)

# What is Data Visualization

## Elements of Design – Grouping / Spacing

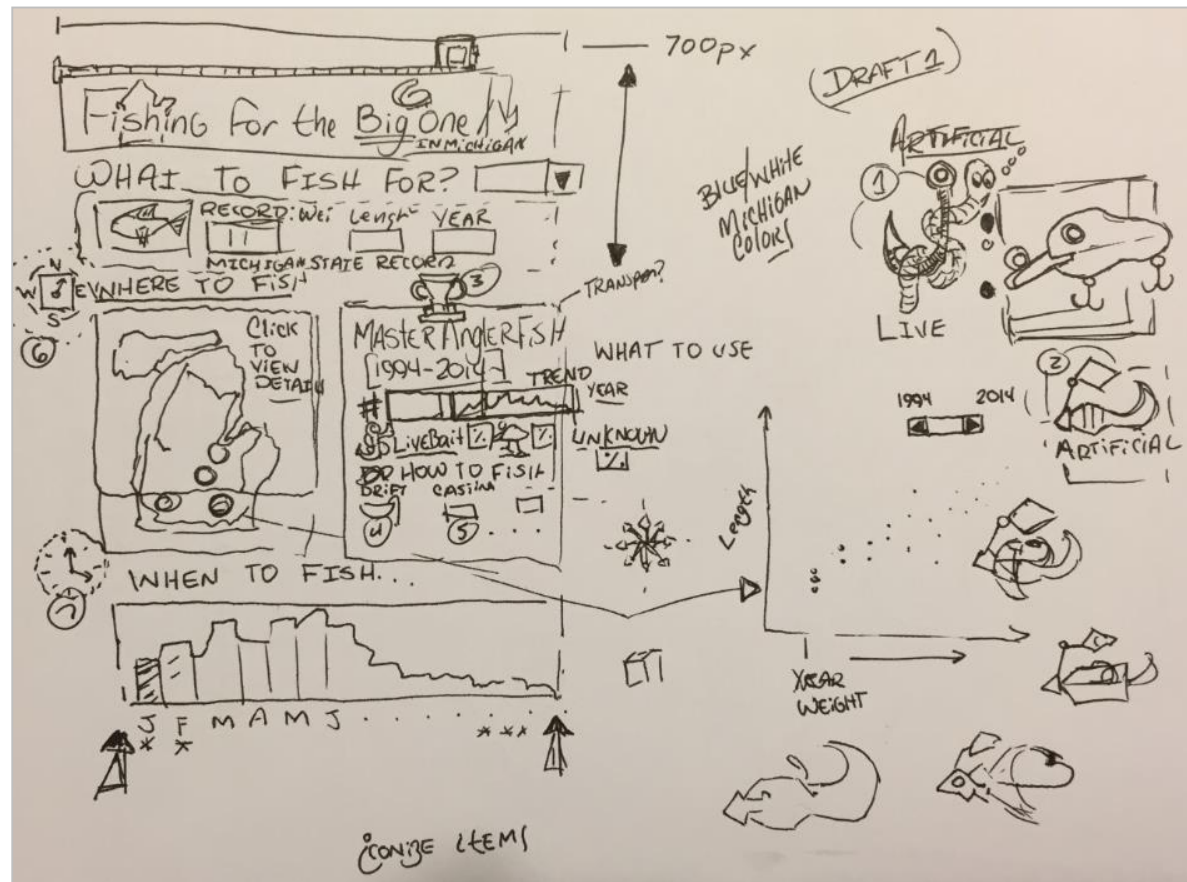
*Grouping and spacing can be used to associate similar elements and provide a narrative or visual flow within the visualization.*



<https://public.tableau.com/s/gallery/50-years-crime-us> Author: [Shine Pulikathara](#)

# What is Data Visualization

## The Iterative Design Process



### Fishin' in the Mitten: Catching the Big Ones in Michigan

Michigan has a diverse selection of gamefish for fishing adventures year round. Select a species from the drop down menu to find out helpful hints for catching the big ones!

**SELECT FISH SPECIES**  
ROUND WHITEFISH-MENOMINE

Michigan State Record(s)	Year	Waterbody	County	Inches	Pounds
	1992	Lake Michigan	Ottawa	21.50	4.06

WHERE TO FIND ROUND WHITEFISH-MENOMINES

ROUND WHITEFISH-MENOMINES are panfish prevalent in Michigan that are members of the sunfish family. They can be taken on light tackle.

Based on Master Angler records from 1993-2014, the map to the left shows the "hot spots" for ROUND WHITEFISH-MENOMINE. The size of the circle represents the total Master Angler award level fish caught in that location. Zoom in, mouse over or click on a circle for additional information about that location.

TOP FISHING METHODS AND TOP 10 BAITS FOR BIG ROUND WHITEFISH-MENOMINES (How to)

Fishing Method	Percentage	Rank	Bait	Percentage
Stillfishing	71.29%	1	Spawn	16.08%
Ice Fishing	8.91%	2	Wax Worm	16.08%
Baitcasting	7.92%	3	Wiggler	9.05%
Driftfishing	5.45%	4	Nightcrawler	5.53%
Spincasting	2.48%	5	Salmon Egg	5.03%
Trotting	1.98%	6	Wigglers	5.03%
Spear	0.99%	7	Single Salmon Egg	4.02%
Flycasting	0.50%	8	Salmon Eggs	2.51%
Unknown	0.50%	9	Wax Worms	2.51%
		10	Worm	2.51%

WHEN TO FISH FOR ROUND WHITEFISH-MENOMINES

Month	Count
Feb	15
Mar	24
Apr	48
May	19
Jun	14
Jul	4
Aug	5
Sep	5
Oct	20
Nov	44
Dec	3

*Handwritten annotations include: SEEM SMALL, +1 FONT, DATA REFERENCES, DASH BOARD, MAKE THIS MORE pronounced?, Colorful, Add these descriptions to text, Somehow center map, Provide Division? Somehow, CENTER THIS whole Printing, Turn off border, CRUNCH, Click to filter, Tooltip, DIVISION, Tool tip mouseover, SQUISH, Detailed text here, Add text here, Turn off border, CRUNCH, Click to filter, Tooltip, DIVISION.*

# What is Data Visualization

## Detailed Example - Design

Hierarchy

Fishing Navigator | Data References

### Fishin' in the Mitten: Catching Big Fish in Michigan

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**SELECT A FISH SPECIES**  
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**WHERE TO FIND BIG BLUEGILL**

For big bluegill, look no further than Houghton Lake. Use a leech and be prepared to become a Master Angler!

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**TOP FISHING METHODS AND BAITS FOR BIG BLUEGILLS**

Stillfishing	46.13%	CRAWLER	28.27%
Spincasting	16.47%	WORM	18.08%
Drifffishing	12.75%	WAX WORM	9.02%
Baitcasting	10.33%	LEECH	8.29%
Ice Fishing	6.61%	RED WORM	2.16%
Trolling	3.89%	CRAWLER HARNESS	1.94%
Flycasting	3.63%	LEAF WORM	1.86%
		CRICKET	1.64%

Grouping

Grouping

Balance

Fishing Navigator | Data References

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Flycasting	3.63%	LEAF WORM	1.86%
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Now . . .

Back to Tableau

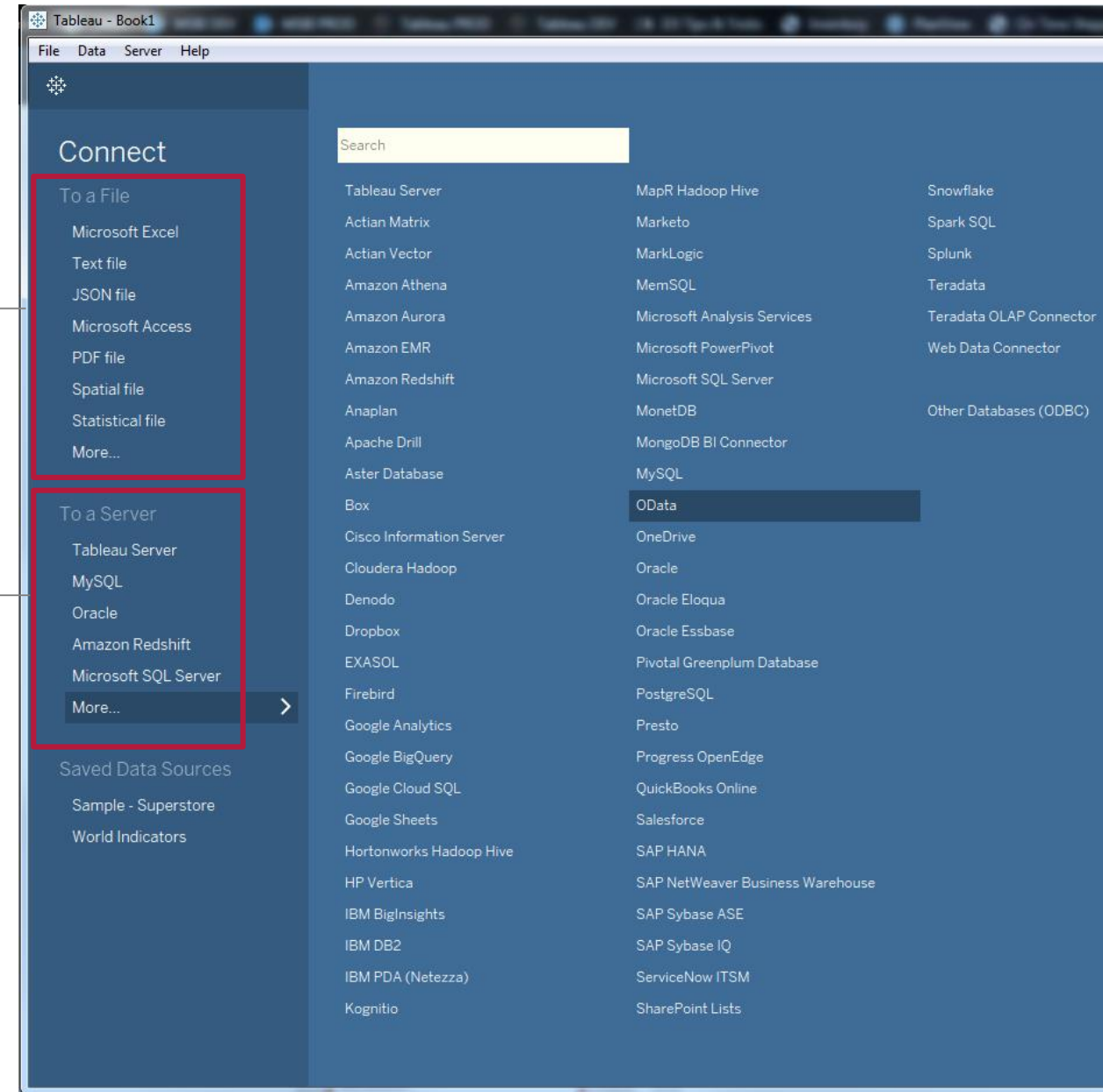
**General Overview**

## Tableau – General Overview

- All worksheets & dashboards start with data
- Tableau connects to almost every type of data file imaginable
- You can join across different type of data sources!

**Files**  
(Excel, CSV,  
JSON, SAS...)

**Servers**  
(Databases)



## Tableau – General Overview – simple example

- A simple table with 15 rows of data in an Excel spreadsheet
- Build an interactive dashboard in under three minutes

	A	B	C	D	E
1	<b>Product Type</b>	<b>State</b>	<b>Zip Code</b>	<b>Sales</b>	<b>Profit</b>
2	Chairs	Michigan	49012	\$ 78,847	\$ 13,462
3	Chairs	Michigan	49008	\$ 42,998	\$ 2,578
4	Chairs	Michigan	49014	\$ 39,554	\$ 3,998
5	Chairs	Michigan	49007	\$ 10,973	\$ 2,112
6	Chairs	Ohio	45891	\$ 9,558	\$ 940
7	Chairs	Ohio	45888	\$ 51,831	\$ 6,443
8	Chairs	Ohio	45871	\$ 34,972	\$ 5,504
9	Desks	Michigan	49012	\$ 30,838	\$ 1,134
10	Desks	Michigan	49008	\$ 71,298	\$ 5,720
11	Desks	Michigan	49014	\$ 11,558	\$ 1,756
12	Desks	Michigan	49007	\$ 74,435	\$ 31
13	Desks	Ohio	45891	\$ 52,503	\$ 10,610
14	Desks	Ohio	45888	\$ 45,530	\$ 397
15	Desks	Ohio	45871	\$ 84,076	\$ 6,996

Tableau - Book2

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Standard

**Data** Analytics

[Connect to Data](#)

**Dimensions**

**Measures**

Pages

Columns

Rows

Filters

Sheet 1

Drop field here

Drop field here

Drop field here

Marks

Automatic

Color Size Text

Detail Tooltip

Show Me

Connect to data

Data Source Sheet 1

The image shows the Tableau software interface. At the top, there is a menu bar with options: File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, and Help. Below the menu bar is a toolbar with various icons for navigation and editing. The main workspace is divided into several panes. On the left, there is a 'Data' pane with a 'Connect to Data' link and sections for 'Dimensions' and 'Measures'. Above the main workspace are 'Pages', 'Columns', and 'Rows' shelves. The main workspace itself is labeled 'Sheet 1' and contains three 'Drop field here' prompts. To the right of the main workspace is a 'Marks' card with a dropdown menu set to 'Automatic' and buttons for 'Color', 'Size', 'Text', 'Detail', and 'Tooltip'. On the far right, there is a 'Show Me' panel displaying a grid of various chart types and a 'Connect to data' button. At the bottom, there is a status bar with 'Data Source' and 'Sheet 1' tabs, and a set of navigation icons.



## Tableau – General Overview Calculated Fields

zz\_ ×

```
if CONTAINS([Product Type], "CHAIR")
  then "SEATING"
else "NOT SEATING" END
```

All ▼

Enter search text

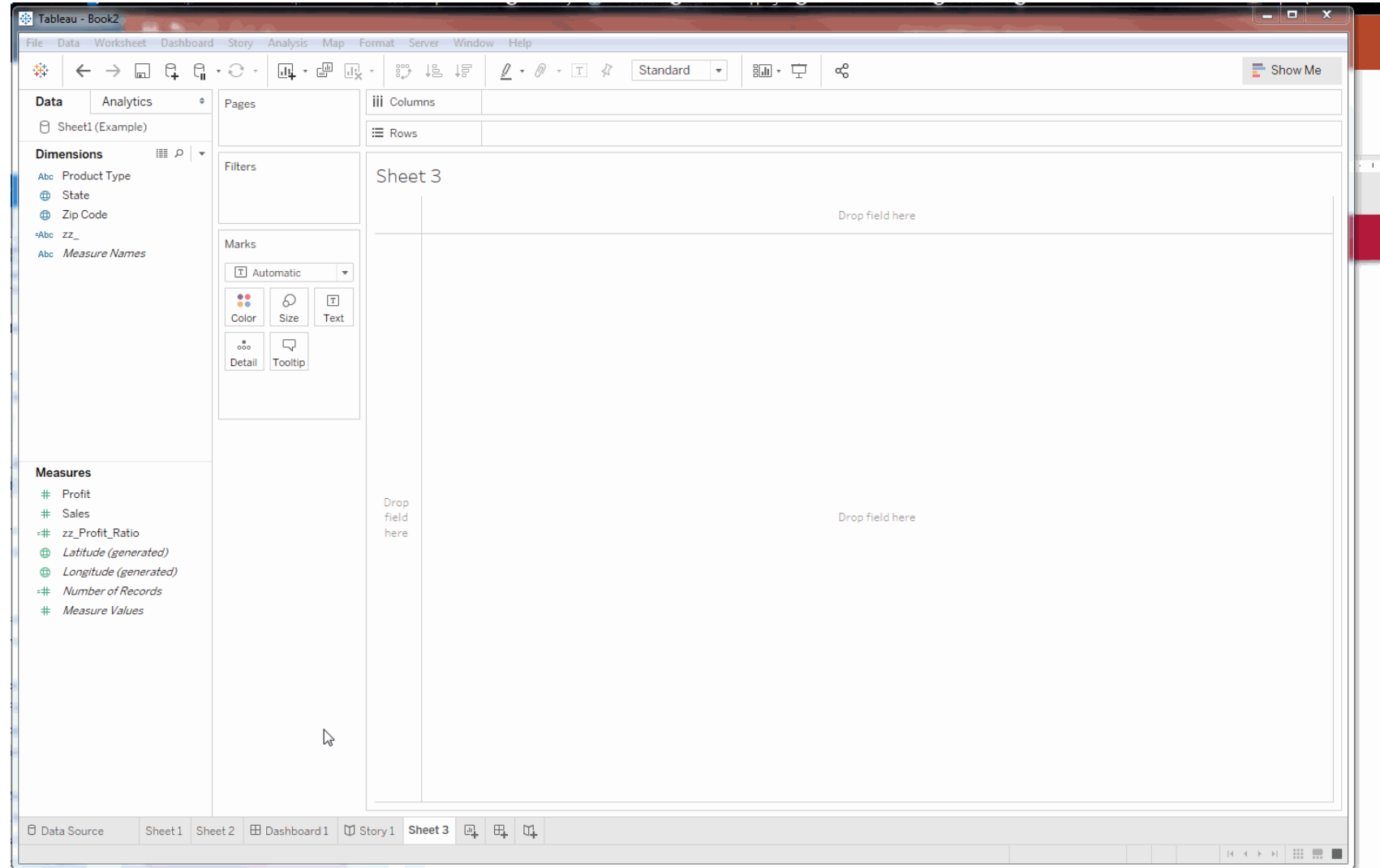
- ASCII
- ASIN
- ATAN
- ATAN2
- ATTR
- AVG
- CASE
- CEILING
- CHAR
- COLLECT
- CONTAINS**
- CORR
- COS
- COT
- COUNT
- COUNTD
- COVAR
- COVARP
- DATE
- DATEADD
- DATEDIFF
- DATENAME

**CONTAINS(string, substring)**  
Returns true if the string contains the substring.  
Example:  
CONTAINS("Calculation", "alcu") is true

The calculation is valid. Apply OK

# Tableau – General Overview

## Basic Analytics



## Tableau – General Overview: Bringing it all together

- Many different worksheets, text boxes, parameters, and filters come together to create a dashboard
- Multiple dashboards can be 'chained' together so that users are guided through multiple analytical paths

**Text Box**

**Text Box**

**Worksheet #3**

**Worksheet #2**

**Text Box**

**Worksheet #1**

Fishing Navigator
Data References

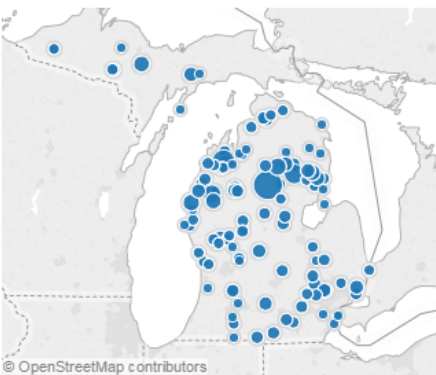
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BLUEGILL

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© OpenStreetMap contributors

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#### TOP FISHING METHODS AND BAITS FOR BIG BLUEGILLS

Stillfishing 46.13%	CRAWLER 28.27%
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Driffishing 12.75%	WAX WORM 9.02%
Baitcasting 10.33%	LEECH 8.29%
Ice Fishing 6.61%	RED WORM 2.16%
Trolling 3.89%	CRAWLER HARNESS 1.94%
Flycasting 3.63%	LEAF WORM 1.86%
	CRICKET 1.64%

**Parameter**

**Text Box**

**Worksheet #6**

**Worksheet #5**

**Worksheet #4**

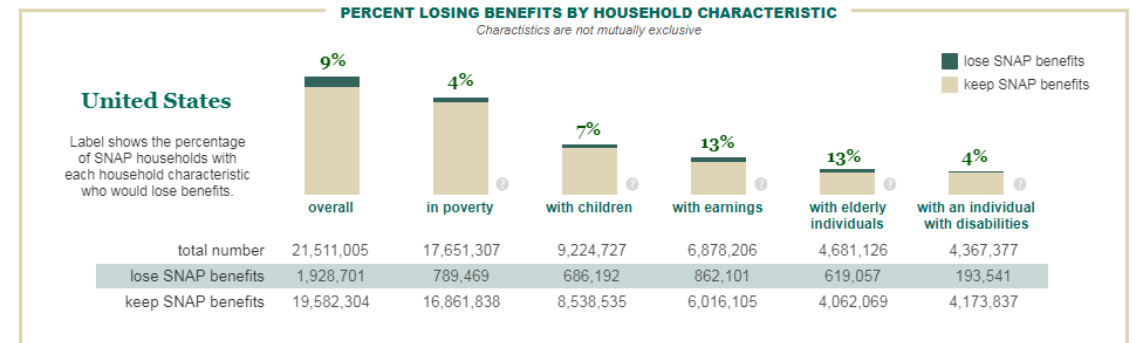
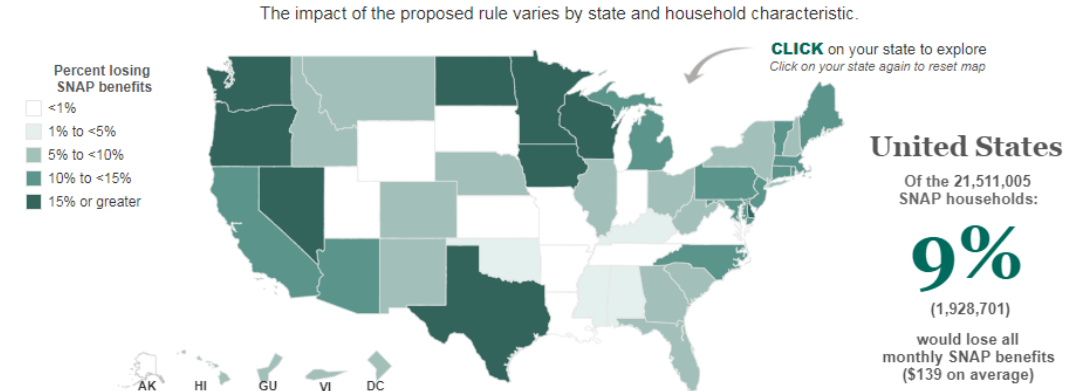
# Use for Reporting - Examples

## Tableau – Reporting Example

- The results of detailed statistical analysis can be made available freely on Tableau Public where individuals can interact with data visualizations to view results – to supplement published research or publicly available reports
- Expands the audience for consuming research and provides a visual and interactive experience.

### Impact of Proposed Policy Changes to SNAP Categorical Eligibility by State

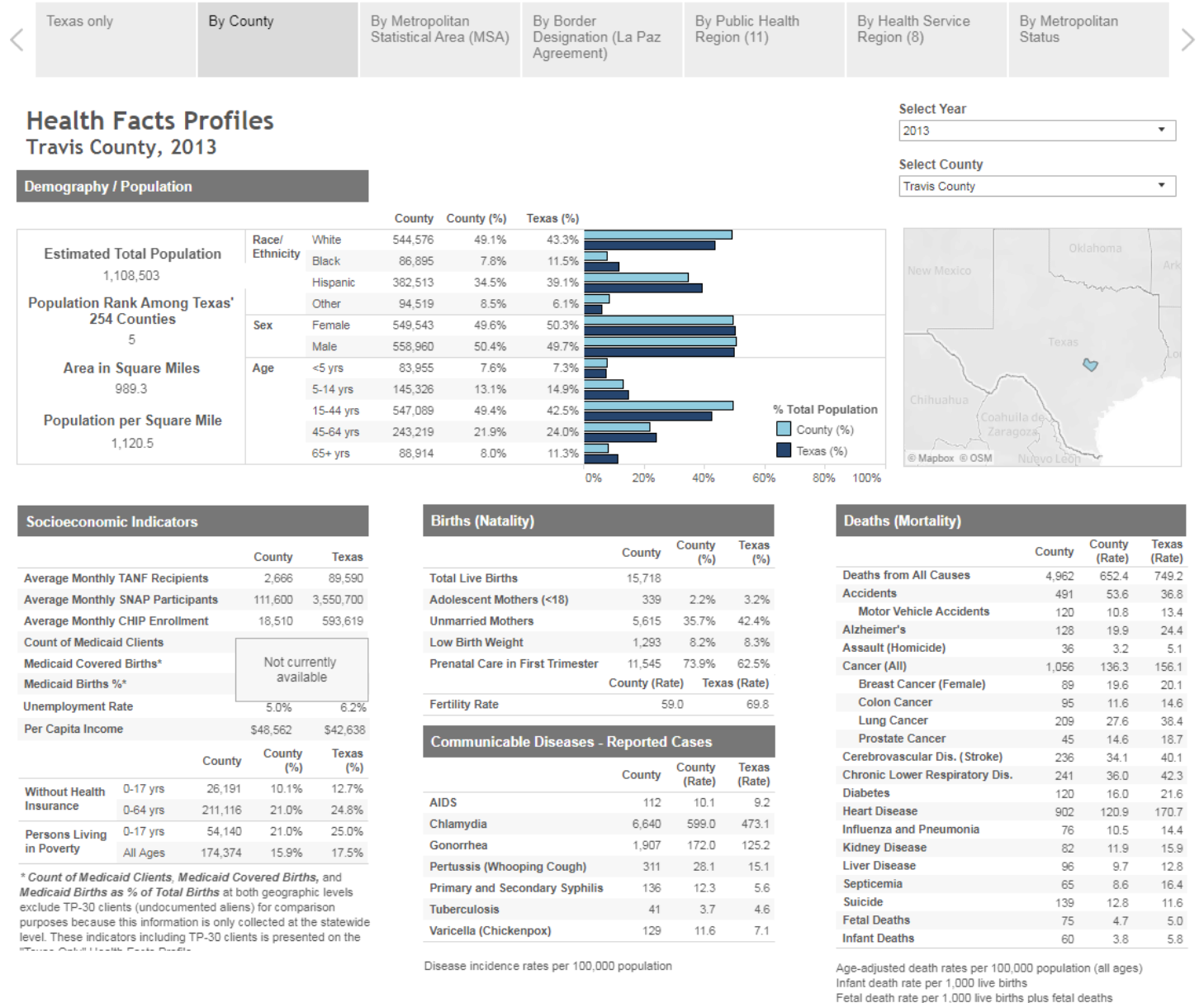
On July 24, 2019, the United States Department of Agriculture (USDA) issued a proposed rule to eliminate SNAP categorical eligibility. USDA estimates that, under the proposed rule, 9 percent of current SNAP households would not otherwise meet SNAP's income and resource eligibility requirements and would therefore lose all of their SNAP benefits. This visualization explores the impact of the proposed rule by state and household demographic.



Source: Fiscal Year 2016 SNAP Quality Control sample. In FY 2016 there were 11 states that did not employ BBCE policies. Indiana implemented their BBCE policy in FY 2018. This visualization was funded by the Robert Wood Johnson Foundation. For detailed estimates or for more information about SNAP microsimulation modeling or Mathematica's work in this area, contact Senior Research Programmer Sarah Lauffer at SLauffer@mathematica-mpr.com or (206) 539-5792.

## Tableau – Reporting Example

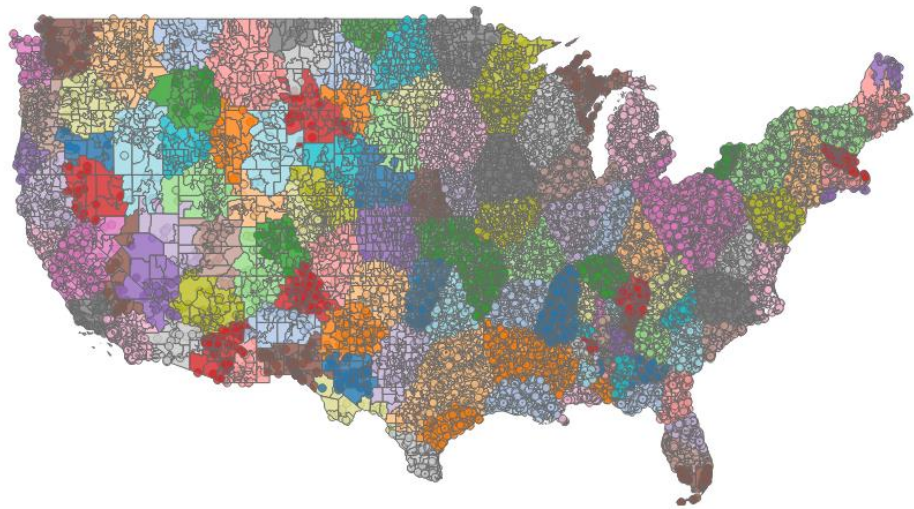
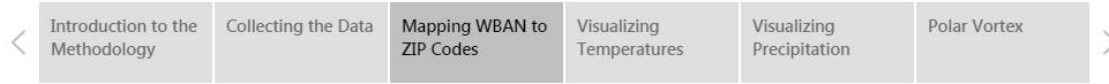
- Story Points – (a Tableau feature) provides a user experience similar to PowerPoint but with interactive data visualizations
- This allows for guided analytics where you create a general narrative and allow users to interact with visualizations to ‘deep dive’ into key points.



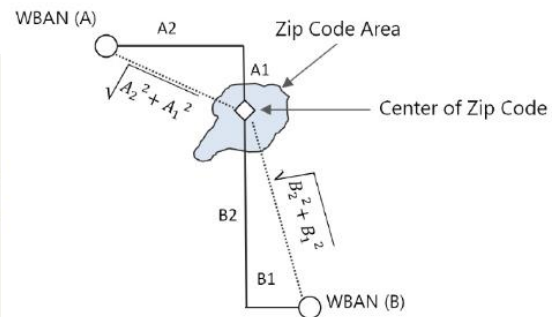
# Use for Storytelling - Examples

# Tableau – Storytelling Example (Story Points)

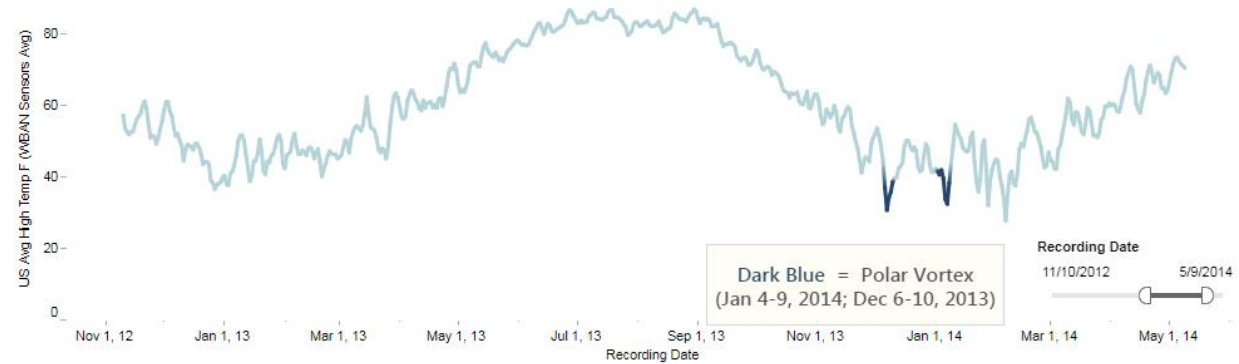
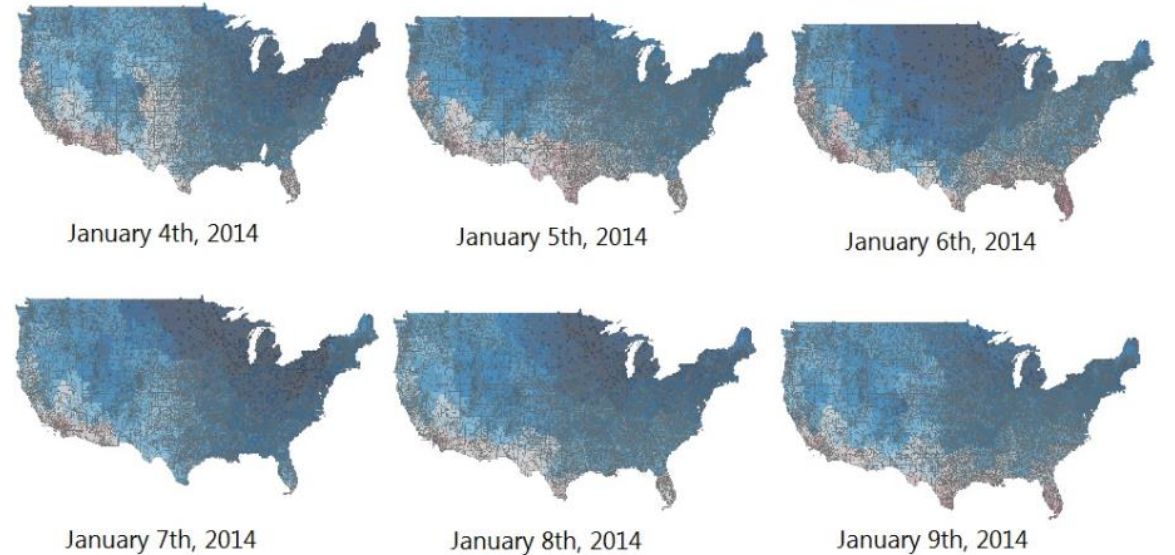
## Visualizing Weather Data in Tableau Software



To map each ZIP code to the nearest WBAN, a simple pairwise comparison was used. For each ZIP code, a distance was calculated from the center of the ZIP code to the location of each WBAN utilizing the Latitude and Longitude data from the dataset. Each ZIP code was assigned to one WBAN sensor based on the minimum calculated distance in the pairwise matrix. The map above shows the ZIP codes assigned to each sensor.

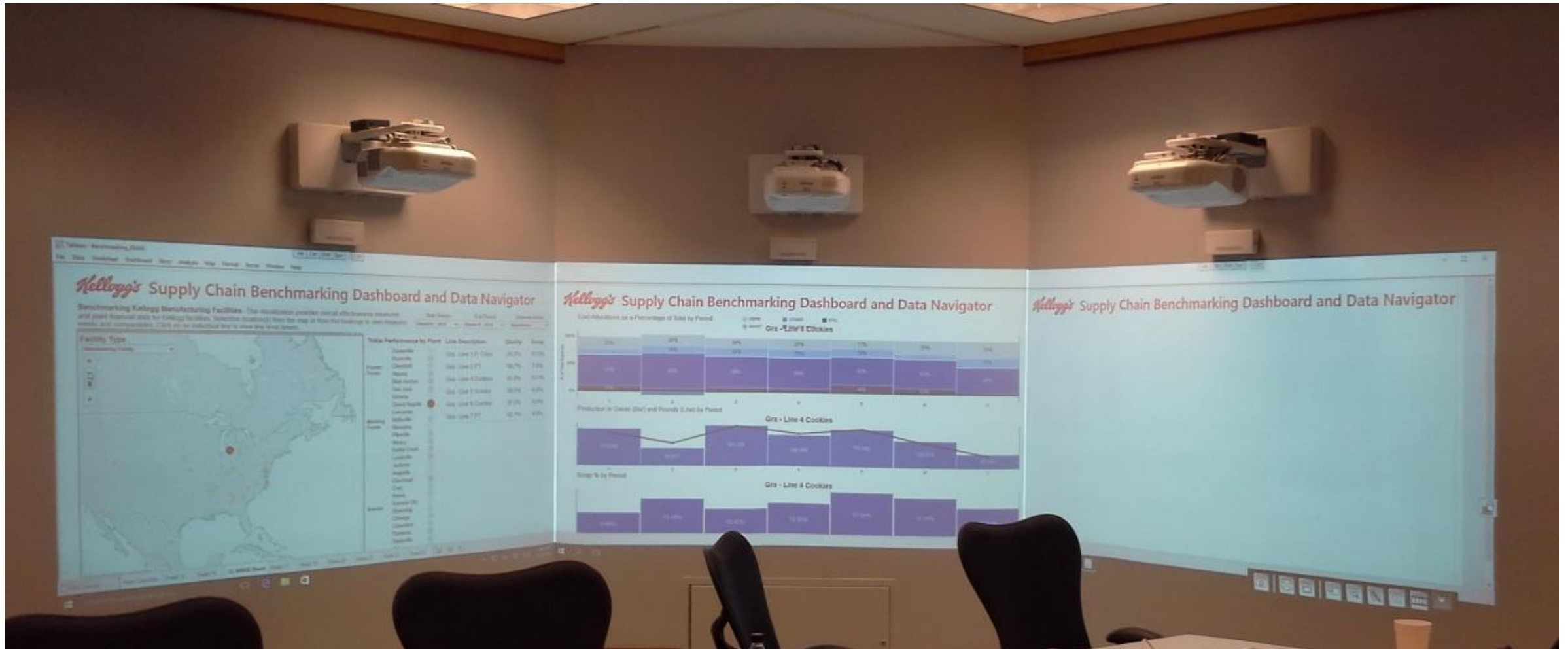


## Visualizing Weather Data in Tableau Software





## Tableau – Storytelling Example (K-MAX)



# Advanced Features - Examples

## Advanced Features – Connecting Tableau to “R”

- Step #1
  - Install “R” or “R” Studio on your computer
  - Load the Rserve library package
  - Start Rserve

```

Console ~/
R version 3.6.0 (2019-04-26) -- "Planting of a Tree"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[workspace loaded from ~/.RData]

> library(Rserve)
> Rserve()
Starting Rserve...
"C:\Users\usknxa19\DOCUMENTS\R\R-36~1.0\library\Rserve\libs\x64\Rserve.exe"
  
```

## Advanced Features – Connecting Tableau to “R”

- Step #2
  - Connect Tableau to your Rserve instance

The screenshot shows the Tableau Desktop interface with the following components:

- Menu Bar:** File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, **Server**, Window, Help.
- Toolbars:** Navigation, View, and Show Me.
- Left Panel (Data Source: MLB GAMES):**
  - Dimensions:** Away, Awayruns, Gameday, Home, Homeruns, ID, zz\_date, Measure Names.
  - Measures:** F1, zz\_R\_Script, Number of Records, Measure Values.
  - Parameters:** Date Par.
- Filters:** Gameday, Away.
- Marks:** Automatic.
- Columns:** Gameday, Away, Awayruns, Home, Homeruns.
- Rows:** Gameday (6/4/2019).
- Main View:** A table of game data with a tooltip over the 'Away' column for the first row.
- Table Data:**

Gameday	Away	Awayruns	Home	Homeruns
6/4/2019	Atlanta	12	Pittsburgh	5
	Baltimore	12	Texas	11
	Boston	8	Kansas City	3
	Chi White S..	5	Washington	9
	Cincinnati	4	St. Louis	1
	Colorado	3	Chi Cubs	6
	Houston	11	Seattle	5
	LA Dodgers	9	Arizona	0
	Miami	16	Milwaukee	0
	Minnesota	2	Cleveland	5
	NY Yankees	3	Toronto	4
	Oakland	4	LA Angels	2
	Philadelphia	9	San Diego	6
	San Francis..	9	NY Mets	3
	Tampa Bay	6	Detroit	9
- Right Panel:** Show Me, Gameday (All), Date Par (6/4/2019), and visualization suggestions.
- Status Bar:** 15 marks, 15 rows by 1 column.

## Advanced Features – Connecting Tableau to “R”

- Step #3
  - Write “R” script within a calculated field in Tableau

**Note:** This is also generally the same way to connect Tableau to Python in Anaconda – with a few small configuration differences.

### Measures

-# Away Score →  
 -Abc Away Team  
 -# Home Score  
 -Abc Home Team  
 -# zz\_Axis\_1  
 -# zz\_date2  
 -# zz\_Total  
 -Abc zz\_Winner\_Color\_AWAY  
 -Abc zz\_Winner\_Color\_HOME  
 -# Number of Records  
 # Measure Values

### Parameters

📅 Date Par

```
INT(SCRIPT_Str("library(xml2);
dater <- as.Date(Sys.Date()-.arg2);
year <- paste('year ', format(dater, '%Y'), '/', sep = '');
month <- paste('month ', format(dater, '%m'), '/', sep = '');
day <- paste('day ', format(dater, '%d'), '/', sep = '');
xmlFile <-
paste('http://gd2.mlb.com/components/game/mlb/', year,
month, day, 'miniscoreboard.xml', sep = '');
x <- read_xml(toString(xmlFile));
games=xml_children(x);
ns <- xml_ns(x);
awayruns <-xml_attr(games,'away team runs',ns);
awayrunsdf <- as.data.frame(awayruns);
awayrunsdf$ID <- seq.int(nrow(awayrunsdf));
toString(awayrunsdf[.arg1, 1]);
",MAX([Idvalue]),max([zz_date])))
```

## Advanced Features – Example

- Example that queries Major League Baseball's open API for statistics
- "R" script downloads data as an XML file, parses the data and returns the results to Tableau for visualization.

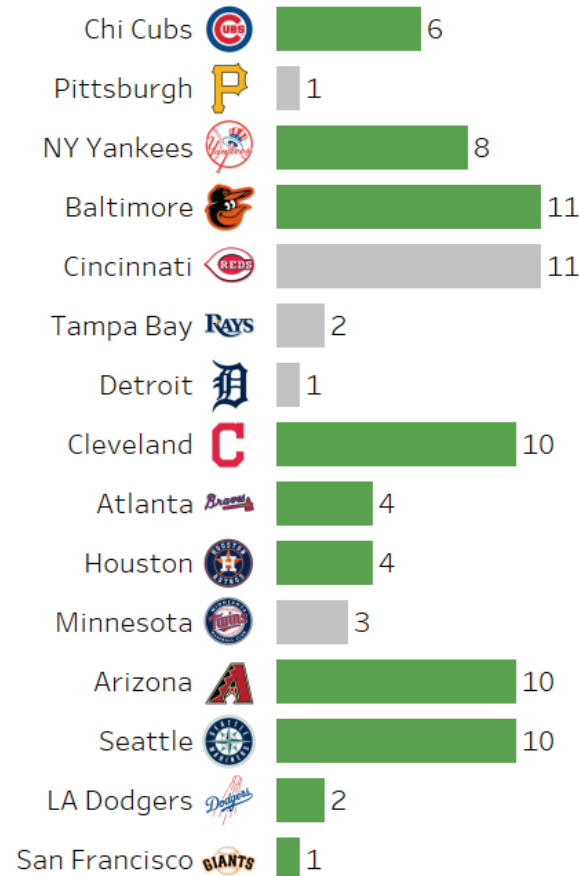


## Major League Baseball Scores by Date

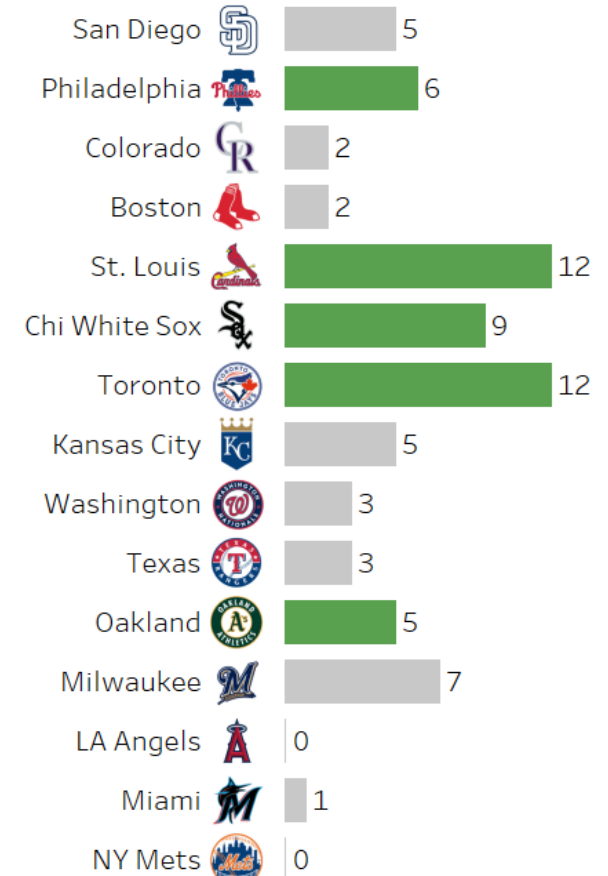
All Images and Data Property of Major League Baseball (MLB)

7/19/2019

### HOME TEAM SCORE

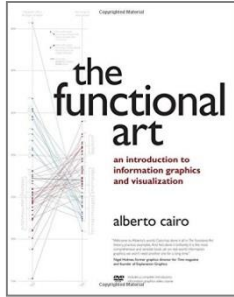


### AWAY TEAM SCORE

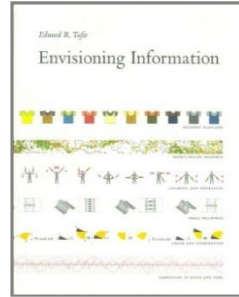


# Available Resources

## Books



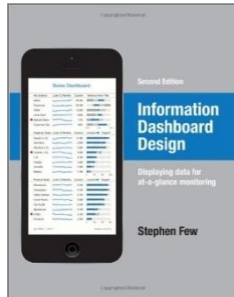
**The Functional Art**  
*Alberto Cairo*



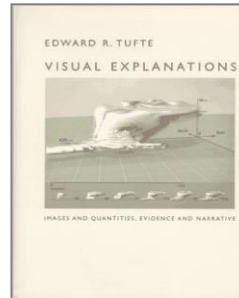
**Envisioning Information**  
*Edward Tufte*



**Design Basics Index**  
*Jim Krause*



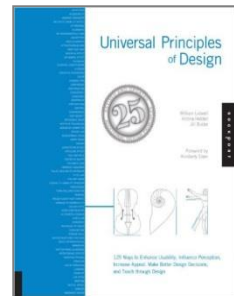
**Information Dashboard Design**  
*Stephen Few*



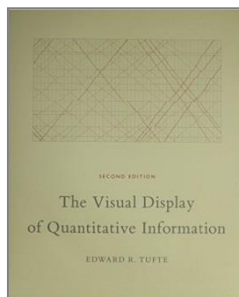
**Visual Explanations**  
*Edward Tufte*



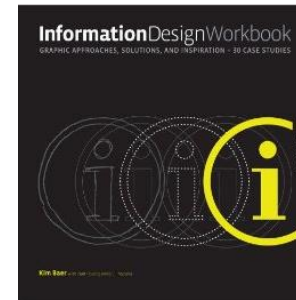
**Beautiful Evidence**  
*Edward Tufte*



**Universal Principles of Design**  
*William Lidwell*



**The Visual Display of Quantitative Information**  
*Edward Tufte*



**Information Design Workbook**  
*Kim Baer*



# Tableau Public & Other Resources

<https://public.tableau.com/s/gallery>

- Daily inspiration through 'viz of the day'
- A place to upload your work to the cloud
- Open environment to share visualizations and data (don't post confidential data here 😊)

<http://www.visualnews.com/>

<http://www.flowingdata.com>

<http://www.thisiscoolossal.com/>

<http://vizwiz.blogspot.com/>

<http://www.datavizdoneright.com/>

National Geographic Magazine  
Bloomberg Businessweek

The screenshot shows the Tableau Public website interface. At the top, there's a navigation bar with 'tableau public', 'GALLERY', 'AUTHORS', 'BLOG', 'RESOURCES', 'ACTIVITY', 'SIGN UP', and 'SIGN IN'. Below the navigation, the 'Viz of the Day' section is featured. The first visualization is titled 'The Rarity of an NFL Tie' by Kim Tricker, dated September 16, 2019. It features a grid of 620 small circles representing NFL overtime games, with a few colored circles indicating ties. Text on the visualization states: 'Since the introduction of the sudden death overtime rule in 1974, TEN TEAMS HAVE NOT PLAYED TO A TIE.' and 'The GREEN BAY PACKERS have played to SIX TIES, the most since 1974.' A second visualization, 'Rule of Law Around the World' by Ratnesh Pandey, dated September 13, 2019, is shown below. It includes a radar chart with six axes: 'Criminal Justice', 'Civil Justice', 'Regulatory Enforcement', 'Fundamental Rights', 'Open Government', and 'Absence of Corruption'. To the left of the radar chart are four bar charts for 'Government Powers', 'Absence of Corruption', 'Open Government', and 'Fundamental Rights', each showing scores for various countries. The overall score for the Rule of Law Index is 0.77, with regional, income, and global ranks of 5/15, 16/38, and 16/126 respectively. A heatmap shows the index's performance from 2015 to 2019.

## West Michigan Tableau Users Group (WMTUG)

<https://community.tableau.com/groups/west-michigan>

- Meet three to four times a year in Kalamazoo or Grand Rapids
- 100-150 participants
- Sharing tips, tricks, and case studies
- Develops a strong network with other analytics focused individuals



## Tableau Conference

- 15,000 of your best data visualization friends in the same place
- One week of in-depth sessions on data visualization and Tableau software

